

FUNGI

Project title: **A Survey of *Pilobolus* from Yellowstone National Park**

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Objective: 1) To obtain isolates of *Pilobolus* to examine for differences in DNA sequences and cellular short chain fatty acid composition. 2) To compare isolates from various locations by contrasting morphological characters to DNA sequences and short chain fatty acids. 3) To analyze and compare nucleic acid sequences in the various isolates to compare and contrast taxa. 4) To analyze and compare cellular short chain fatty acids in the various isolates to compare and contrast taxa. 5) To study the characteristics that can be used to identify isolates.

Findings: During 1999, isolates of *Pilobolus* were collected in Yellowstone National Park during July and October. These isolates were collected from mule deer, buffalo, pronghorn, and elk. They were collected from areas near Madison, Gibbon Meadows, Indian Creek, Canyon, Hayden Valley, and Mammoth Hot Springs.

All isolates have been maintained in the laboratory at Indiana University East and are being used as part of larger studies to distinguish among the species of *Pilobolus*. Collections of *Pilobolus* from this project are maintained at Indiana University East. It should be noted that isolates of *Pilobolus* do not survive well under cultivation. Most isolates of *Pilobolus* collected in earlier years have died.

Project title: **Fungi from Geothermal Soils and Thermotolerant Plants**

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Objective: The proposed research will provide information to increase our understanding of fungal survival in unique environments, the roles of fungi in ecosystem dynamics, and the temporal and spatial scales of the micro-habitats that fungi occupy. Specifically, this work will provide information about: 1) how fungi survive under environmental conditions too harsh for mycelial growth; 2) if fungal community structure changes in response to environmental conditions; 3) if fungi can alter between saprophytic and symbiotic lifestyles in response to environmental conditions; 4) the scale of soil studies necessary to accurately assess the roles of these fungi in ecosystem dynamics; 5) how biological and/or genetic diversity of fungal communities changes in response to environmental conditions; and 6) the adaptive mechanisms of tolerance required for the growth of fungi soils containing high levels of metals and other inorganic chemicals. In addition, the feasibility of developing molecular biological tools will be determined for rapidly assessing a) fungal community structure based on molecular biomass measurements; b) the metabolically active and inactive species of fungal communities; and c) the occurrence of fungi in thermotolerant plants.

Findings: Several fungal species have been isolated from geothermal soils and found to be either mesophilic or thermophilic. The populations of both fluctuate throughout the year as a result of soil temperature and moisture. Fungi are in highest densities in soil under plants and can be found in soils with temperatures up to 100° C. The annual temperatures of the geothermal soils fluctuated as much as 30 – 40° C while non-thermal soils fluctuated 5 – 10° C. There are two classes of fungi present in the soils: saprophytic and symbiotic. The symbiotic fungi colonize the dominant plant species in the geothermal soils (*Dichanthelium lanuginosum*). Preliminary data suggest that the fungal symbiont may be responsible for the ability of the plant to tolerate high temperatures, dry summers, and heavy metals. This project is still in progress.

Project title: **Anti-Cancer Drug Discovery at Yellowstone National Park**

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Objective: Discovery of new anti-cancer drugs from microscopic and near-microscopic fungi isolated from the park's extreme ecosystems.

Findings: The project has not yet started.